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Jun 6, 1995

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TITLE: Colour image formation appts for electrophotographic copier - has clarity setting device made dependent on decision circuit in changing colour-tone correction

PATENT-ASSIGNEE: FUJI XEROX CO LTD (XERF)

PRIORITY-DATA: 1993JP-0291906 (November 22, 1993)

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PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
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APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
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INT-CL (IPC): B41J 2/52; B41J 2/525; G03G 15/01; H04N 1/46; H04N 1/60

ABSTRACTED-PUB-NO: JP 07147641A

BASIC-ABSTRACT:

The apparatus comprises an image data forming device which generates a multi-gradation digital image data of a colour. It also produces colour tone for changing the driving signal of a laser based on an image data.

An image processor performs colour-tone correction of an image data. It has a decision circuit (104) for distinguishing an image data. It is based on the output of an isolation circuit (101) which separates half tone images. A production circuit (103) produces a histogram and a density level circuit (102) provides the density level of a single page. With the density level a clarity setting device (105) alters the colour-tone correction parameter.

ADVANTAGE - Eliminates skill for visual-angle of operator by installing decision circuit, therefore, providing good copy of documents.

ABSTRACTED-PUB-NO: JP 07147641A

EQUIVALENT-ABSTRACTS:

CHOSEN-DRAWING: Dwg.5/6

DERWENT-CLASS: P75 P84 S06 T04 W02

EPI-CODES: S06-A11; S06-A16A; T04-G07; W02-J03A2; W02-J04;

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(71)Applicant : FUJI XEROX CO LTD

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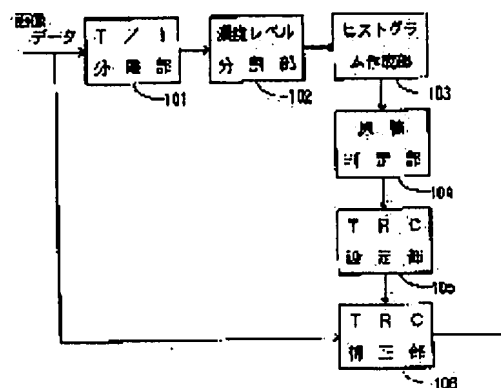
(54) COLOR IMAGE FORMING DEVICE PROVIDED WITH PICTURE QUALITY EMPHASIS MODE

(57)Abstract:

PURPOSE: To provide the color image forming device provided with picture quality emphasis mode to easily form beautiful color images by deciding the features of images.

CONSTITUTION: Concerning the color image forming device composed of image data generating means for generating color multi-gradation digital image data, image processing means for performing the tone correction of image data and image forming means for forming images by generating the driving signals of lasers based on the tone corrected image data, the image processing means is provided with a

picture/character separating means 101 for separating the half tone images of photographs or the like and the binary images of characters or the like, histogram preparing means 102 and 103 for preparing the histogram of a density level for one page by colors, deciding means 104 for deciding the features of images from the histogram of half tone images, and picture quality setting means 105 for changing picture quality by changing the setting of a parameter for tone correction from the features of images decided by the deciding means. Thus, the tone correction can be performed corresponding to the features of images, and beautiful color images can be



formed.

LEGAL STATUS

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CLAIMS

[Claim(s)]

[Claim 1] An image data generation means to generate the multi-tone digital image data of a color, In the color picture formation equipment which consists of an image-processing means to perform color tone amendment of image data, and an image formation means to generate the driving signal of laser based on the image data after performing color tone amendment, and to form an image A pictorial symbol separation means by which an image-processing means separates halftone images, such as a photograph, and binary images, such as an alphabetic character, A histogram creation means to create the histogram of the concentration level for 1 page according to a color, It has a judgment means to judge the description of an image from the histogram of a halftone image, and an image quality setting-out means to make a setting-out change of the parameter of color tone amendment from the description of the image judged with this judgment means, and to change image quality. Color picture formation equipment equipped with the image quality emphasis mode characterized by constituting so that a setting-out change of the parameter of color tone amendment may be made according to the description of an image with this image quality setting-out means at the time of image quality emphasis mode.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to color picture formation equipment equipped with an image data generation means to generate the multi-tone digital image data of a color, an image-processing means to perform color tone amendment of image data, and an image formation means to form the image which generated the driving signal of laser based on the image data after performing color tone amendment.

[0002]

[Description of the Prior Art] In an electrophotography copying machine, since the reading signal of a manuscript is changed for example, into 256 digital gradation, spatial frequency, a color tone, concentration, etc. are adjusted and it changes and outputs to the driving signal of laser, various amendments can be performed.

[0003] For example, as what carries out shade adjustment from the concentration of a manuscript, and an image, JP,03-10571,A (OMRON) is proposed as a previous patent, and JP,03-88568,A (canon) is proposed as what extracts the description of an image and amends spatial frequency.

[0004] The concentration of the former manuscript and the thing which carries out shade adjustment from an image detect the concentration of a manuscript, and the line breadth of the alphabetic character of a manuscript, a notation, a graphic form, etc. by the CCD sensor, carries out fuzzy reasoning of whenever [shade adjustment] according to the fuzzy rule using concentration data and line breadth data, and adjusts the shade to a copying paper.

[0005] Moreover, what extracts the description of the latter image and amends spatial frequency extracts two or more descriptions of an image by the CCD sensor, and amends the spatial frequency of image data, and the feature-extraction pattern of an image is three, an alphabetic character, a halftone dot, and a photograph. This amendment raises the ratio of edge enhancement, when close to an alphabetic character image, when close to a halftone dot image, it raises the ratio of smoothing, and when close to a photograph, it raises a through ratio.

[0006]

[Problem(s) to be Solved by the Invention] However, each above-mentioned proposal mainly improves the nonconformity about an alphabetic character/photograph, the pattern pattern of a photograph manuscript is guessed, and the proposal which makes a good-looking copy is not made. Conventionally, the activity which makes this good-looking copy was done by decision of people. When copying a marine photograph in this case, the saturation of Cyanogen C was raised, a marine feeling of transparence was emphasized, and appearance was improved. That is, although vision decision of an operator was required in order to have made the good-looking copy conventionally, this activity needed skill.

[0007] This invention solves the above-mentioned technical problem, and aims at offering color picture formation equipment equipped with the image quality emphasis mode which can judge the description of an image and can form a good-looking color picture easily.

[0008]

[Means for Solving the Problem] Therefore, an image data generation means by which this invention generates the multi-tone digital image data of a color, In the color picture formation equipment which consists of an image-processing means to perform color tone amendment of image data, and an image formation means to generate the driving signal of laser based on the image data after performing color tone amendment, and to form an image A pictorial symbol separation means by which an image-processing means separates halftone images, such as a photograph, and binary images, such as an alphabetic character, A histogram creation means to create the histogram of the concentration level for 1 page according to a color, It has a judgment means to judge the description of an image from the histogram of a halftone image, and an image quality setting-out means to make a setting-out change of the parameter of color tone amendment from the description of the image judged with this judgment means, and to change image quality. It is characterized by constituting so that a setting-out change of the parameter of color tone amendment may be made according to the description of an image with this image quality setting-out means at the time of image quality emphasis mode.

[0009]

[Function] With color picture formation equipment equipped with the image quality emphasis mode of this invention A pictorial symbol separation means to separate halftone images, such as a photograph, and binary images, such as an alphabetic character, A histogram creation means to create the histogram of the concentration level for 1 page according to a color, Since it has a judgment means to judge the description of an image from the histogram of a halftone image, and an image quality setting-out means to make a setting-out change of the parameter of color tone amendment from the description of the image judged with this judgment means, and to change image quality Color tone amendment can be performed according to the description of an image, and a good-looking color picture can be formed.

[0010]

[Example] Hereafter, an example is explained, referring to a drawing. Drawing 1 is drawing for explaining one example of color picture formation equipment equipped with the image quality emphasis mode of this invention. In a color electrophotography copying machine, if the manuscript laid in platen glass is illuminated and scanned with the halogen lamp for lighting, image formation of the scanned image will be carried out on a CCD licenser with an image formation lens, and it will be changed into the picture signal for every line by the CCD licenser. The output of this CCD licenser is changed into the image data of the digital signal in every pixel with an A/D converter, and the multi-tone image data of 8 bits and 256 gradation is obtained about 1 pixel. This image data is again changed into an analog signal with a D/A converter, after TRC (color tone) amendment of the filtering is performed and carried out. This analog signal is compared with the chopping sea in a cycle of 1 pixel. And it becomes the input of a laser driver line and laser is driven with the pulse width corresponding to the concentration level for every pixel. In such color picture formation equipment, it has the image quality emphasis mode which judges the description of a manuscript by the configuration shown in drawing 1 , and carries out TRC amendment of the image quality according to the description of a manuscript by this invention.

[0011] In drawing 1 , the T/I separation section 101 performs the so-called pictorial symbol separation which blocks the image data of 1 pixel by which A/D conversion was carried out, for example, 8 bits, and 256 gradation to 3x3 or 5x5, and identifies halftone image data (image data), such as a photograph, or binary image data, such as an alphabetic character. The histogram creation section 103 counts the number of pixels for 256 gradation of the separated halftone image data according to K, Y, M, and C for every divided concentration level by dividing into 0-64, 65-128, 129-192, and the concentration level of 193-255, and the concentration level division section 102 creates the histogram for the page 1 of a manuscript. The manuscript judging sections 104 are K, Y and M which were created, and a thing which judges the description of a manuscript from the histogram according to C. The TRC setting-out section 105 A switch signal performs a switch in faithful rendering mode and image quality emphasis mode. In the case of faithful rendering mode The same usual TRC amendment as the former is performed, and in the case of image quality emphasis mode, the parameter of the TRC amendment section 106 is set up so that image quality according to the description of the manuscript judged in the manuscript judging

section 104 may be emphasized for TRC amendment.

[0012] For example, it is supposing the 1-page following histograms are created,

分割濃度レベル		K	Y	M	C
I 1	0 ~ 6 4	1	3	2	5
I 2	6 5 ~ 1 2 8	1	2	2	1 7
I 3	1 2 9 ~ 1 9 2	0	5	1 5	2 3
I 4	1 9 3 ~ 2 5 5	0	1	2 1	5 7

If the description of an image is seen with this histogram, Cyanogen C can judge with it being the manuscript of the sea or empty strongly. In such a case, in image quality emphasis mode, by switching the parameter setup of the TRC amendment section 106 in the TRC setting-out section 105, TRC amendment of the image quality is carried out so that the saturation of cyanogen may be raised.

[0013] Drawing in which drawing 2 shows other examples of the manuscript judging section of this invention, drawing 3, and drawing 4 are drawings showing the example of a membership function and fuzzy reasoning, 107 shows the fuzzy-ized section and 108 shows the fuzzy reasoning section. in drawing 2, the fuzzy-ized section 107 input the frequency data of each division concentration level according to K, Y and M which be created in the histogram creation section 103, and C, and make them fuzzy in ambiguous language using a membership function from the definite value of frequency data, and the fuzzy reasoning section 108 perform fuzzy reasoning based on a fuzzy rule (IF, THEN ..), and presume the description of a manuscript.

[0014] Drawing 3 and drawing 4 expressed the operation in the fuzzy rule 1, drawing 3 is the antecedent section and drawing 4 is a consequent part. The rule serves as the following formats.

[0015]

Rule 1: IF K-I1=NL & K-I2=NL & K-I3=NL & K-I4=NL & Y-I1=NL & Y-I2=NL & Y-I3=NL & Y-I4=NL & M-I1=NL & M-I2=NL & M-I3=NS & M-I4=NS & C-I1=NL & C-I2=NS & C-I3=PS & C-I4=PL THEN Y saturation = NS & M saturation = NS & C saturation = PL & C high concentration = PS & Concentration in C = when filling the rule of the antecedent section (IF) with the rule of PS **, based on directions of a consequent part, a setting-out change of the parameter of color tone amendment is made with the image quality setting-out means 105, and image quality is amended in the TRC amendment section 106.

[0016] The Brock block diagram of the color picture formation equipment with which drawing 5 was equipped with the image quality emphasis mode of this invention, and drawing 6 are the global placement block diagrams of the scanner section, the image-processing section, an ROS optical department, and the image formation section. In addition, this invention is not limited to such a copying machine, and is applied to the digital type multicolor electrophotography equipment which, in short, has a development means by which two or more colors differ, and imprints the toner image of two or more colors in piles on a form.

[0017] A color electrophotography copying machine consists of the scanner section 1 which divides roughly as shown in drawing 5 and drawing 6, and reads a manuscript, the image-processing section 2 which processes the image data of the read manuscript, an ROS optical department 3 which drives laser according to the processed image data, and irradiates a light beam at a photo conductor, and the image formation section 4 which forms an image.

[0018] In the scanner section 1, the exposure lamp 6 is irradiated at the manuscript 5 laid in the

manuscript base, the reflected light is read to every B (blue), G (green), and R (red) with a light filter and CCD series 7, and the reading signal is changed into image data digital with A/D converter 9 after magnification to suitable level with an amplifier 8. And after amending the sensibility for every pixel of a sensor about the image data in the shading compensation circuit 10 and amending the timing for every pixel of a sensor in the gap amendment circuit 11, it changes into the concentration data of K (black), Y (yellow), M (Magenta), and C (cyanogen) which are the primary color of a toner from reflection factor data by the concentration transducer 12.

[0019] In the image-processing section 2, while performing separation discernment of an alphabetic character/photograph from concentration data in the image presumption circuit 13, the histogram of division concentration level is created, the description of a manuscript is presumed, and TRC amendment is performed in the TRC amendment circuit 14. And it changes into analog data with D/A converter 15, and sends to a comparator 17 through a selector 16. A comparator 17 compares the chopping sea signal in a cycle of [which is sent from the analog data and the chopping sea generator 18 of D/A converter 15] 1 pixel, performs pulse width modulation, and changes it into the binary-ized image data for turning on / turning off laser. In this Pulse Density Modulation, it is changed into the binary-ized image data from which a part with a larger part smaller than "1" (laser-on) and a chopping sea than a chopping sea is set to "0" (laser-off), for example, and the signal of the pulse width corresponding to the concentration level for every pixel is acquired. That is, in the image-processing section 2, the T/I separation section 101 explained by drawing 1, the concentration level division section 102, the histogram creation section 103, and the manuscript judging section 104 are constituted from an image presumption circuit 13, and the TRC setting-out section 105 and the TRC amendment section 106 consist of TRC amendment circuits 14.

[0020] The pattern generating means 19 is a means to generate the object for a concentration judging, and the image pattern for concentration lowering. A selector 16 chooses the analog image data usually changed with D/A converter 15 at the time of a copy, and chooses the image pattern generated with the pattern generating means 19 at the time of image concentration adjustment implementation. At the time of this image concentration adjustment implementation, directions of pattern creation are outputted to the pattern generating means 19 from an arithmetic unit 20, and the pattern generating means 19 generates the image pattern of a predetermined image consistency.

[0021] In the ROS optical department 3, laser 23 is turned on/off controlled based on the binary-ized image data sent from the comparator 17 in the laser actuation circuit 22, and it carries out adjustable [of the laser intensity] with laser intensity adjustable equipment 21. Laser intensity adjustable equipment 21 is controlled by the arithmetic unit 20 of the image formation section 4. The laser light discharged from laser 23 is deflected by the polygon mirror 24, and is irradiated on the photo conductor 27 of the image formation section 4 through the ftheta lens 25 and the reflective mirror 26.

[0022] In the image formation section 4, electrification equipment 28, the potential sensor 29, the rotating type developer 30, the concentration sensor 31, imprint equipment 32, cleaning equipment 33, and the electric discharge lamp 34 are arranged in the perimeter of a photo conductor 27. The rotating type developer 30 has the development counter K for blacks, the development counter Y for yellows, the development counter M for Magentas, and the development counter C for cyanogen, and while each development counter is arranged in the perimeter of body of revolution, a toner is supplied from the toner feeder 35, respectively.

[0023] The imprint film which consists of a film of a dielectric is stretched by the periphery of the imprint drum 36 which constitutes imprint equipment 32, and the imprint drum 36 is directly connected with the electric motor of dedication, or it connects with image support through a gearing, and revolution actuation is carried out in the direction of a graphic display arrow head. The interior and around an outside the imprint drum 36, the electrification equipment for an imprint, a press means, the corotron 39 for exfoliation, the exfoliation pawl, the adsorption roll 41, and the adsorption corotron 42 grade are arranged.

[0024] Furthermore, the arithmetic unit 20 which controls image formation is formed, and the detecting signal of the potential sensor 29 and a photosensor 31 is inputted into an arithmetic unit 20, and while

controlling the toner feeder 37 by the arithmetic unit 20 Control electrification equipment 28 through the amount of electrifications adjustable equipment 45, and development bias is controlled through development bias adjustable equipment 46, and also it is constituted so that laser intensity adjustable equipment 21, the above mentioned selector 16, and the above mentioned pattern generating means 19 may be controlled.

[0025] As for the above-mentioned color electrophotography copying machine, image formation is performed according to a well-known xerography process. That is, minus electrification of the rotating photo conductor 27 is uniformly carried out by electrification equipment 28, and the latent image of the black of the 1st amorous glance is first formed of laser light. This latent image is developed with the black toner by which minus electrification was carried out with the black development counter K of the rotating type developer 30. On the other hand, a form is conveyed through the form conveyance way 43 and the resist roller 44 from the medium tray which is not illustrated, and is adsorbed by said imprint film by a forcing operation of the adsorption roll 41 and the corona discharge of the adsorption corotron 42. A press means is energized at the time of an imprint, and a form is stuck by the photo conductor 27 according to the forcing operation. And the developed image on a photo conductor is imprinted with the electrification equipment for an imprint by the form on an imprint film.

[0026] The toner which remained without imprinting on a photo conductor 27 is removed by cleaning equipment 33. Moreover, a photo conductor 27 is discharged with the electric discharge lamp 34, and minus electrification is again carried out uniformly with electrification equipment 28. And the yellow latent image of the 2nd amorous glance is formed of laser light, and development and an imprint are performed like the above. If the developed image of the 3rd amorous-glance Magenta and the 4th amorous-glance cyanogen is succeedingly imprinted in the same process by the form on the imprint drum 36, it will be fixed to a form with the anchorage device which electric discharge exfoliation is carried out by operation of the corotron 39 for exfoliation and an exfoliation pawl from the imprint drum 36, and is not illustrated, and a color copy will be formed. And this copy cycle of a series of is repeated below.

[0027] In addition, this invention is not limited to the above-mentioned example, and various deformation is possible for it. For example, although the above-mentioned example explained what was applied to the color electrophotography copying machine, you may apply also like the color picture formation equipment like the printer which carries out the formation output of the computer graphics data and others digital color picture data. Moreover, although the configuration processed by the image data decomposed into the primary color of colors, such as RGB and KYMC, explained, you may constitute so that it may process by the data of a color coordinate system like brightness, saturation, and a hue. Furthermore, although the configuration which carries out pulse width modulation using a chopping sea signal, and generates a laser driving signal explained after changing digital image data into an analog, the configuration which generates a laser driving signal using a pattern generator from digital image data may be adopted.

[0028]

[Effect of the Invention] Since an image and its description judgment make from image data and the color tone amendment of image quality performs according to this invention so that clearly [vision decision of an operator is required, and] from the above explanation, although this activity needed skill in order to output a copy with the sufficient appearance according to the description of a manuscript conventionally, there is no room for a problem like the individual difference by the operator to arise, and a copy with the sufficient appearance according to the description of a manuscript can output. And since the copying machine made a judgment from image counted value in addition to the T/I isolation and the histogram creation function which it has from the former, the copy of which it complains to people's organic functions more could be made easily.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing for explaining one example of color picture formation equipment equipped with the image quality emphasis mode of this invention.

[Drawing 2] It is drawing showing other examples of the manuscript judging section of this invention.

[Drawing 3] It is drawing showing the example of a membership function and fuzzy reasoning.

[Drawing 4] It is drawing showing the example of a membership function and fuzzy reasoning.

[Drawing 5] It is the Brock block diagram of color picture formation equipment equipped with the image quality emphasis mode of this invention.

[Drawing 6] It is the global placement block diagram of the scanner section, the image-processing section, an ROS optical department, and the image formation section.

[Description of Notations]

101 [-- The manuscript judging section, 105 / -- The TRC setting-out section, 106 / -- TRC amendment section] -- The T/I separation section, 102 -- The concentration level division section, 103 -- The histogram creation section, 104

[Translation done.]

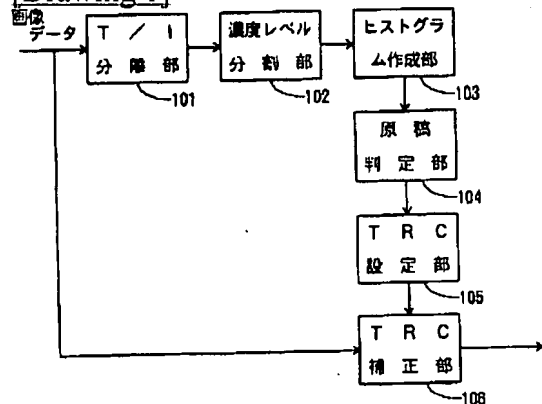
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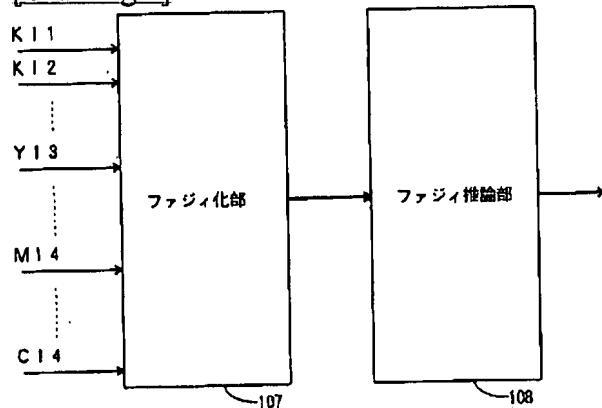
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DRAWINGS

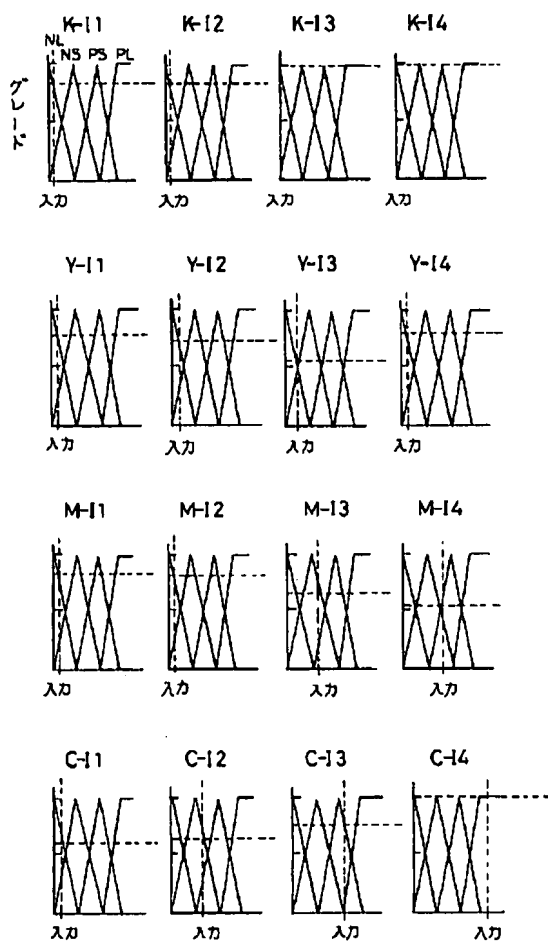
[Drawing 1]



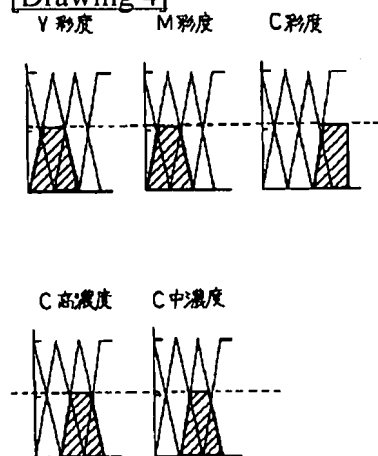
[Drawing 2]



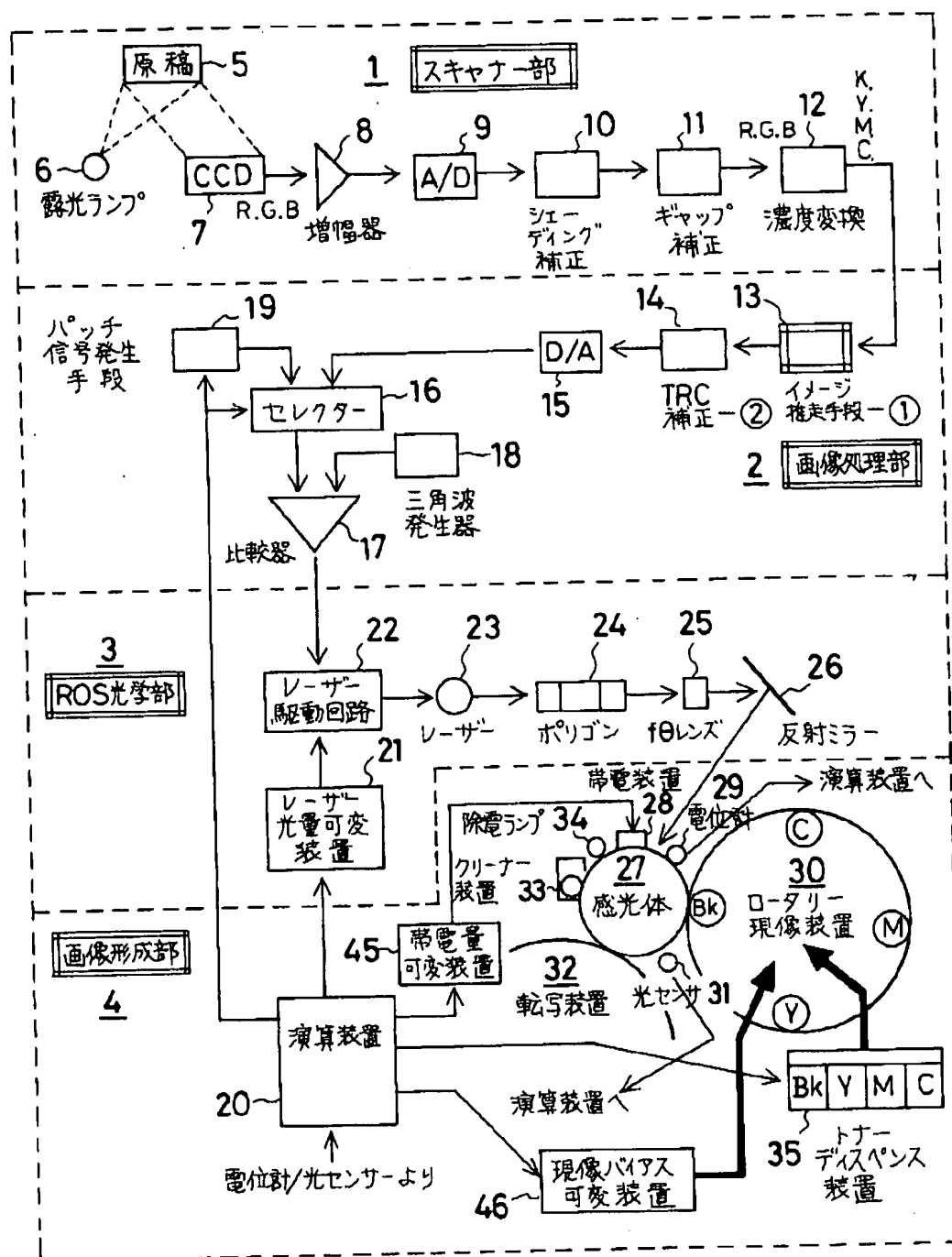
[Drawing 3]



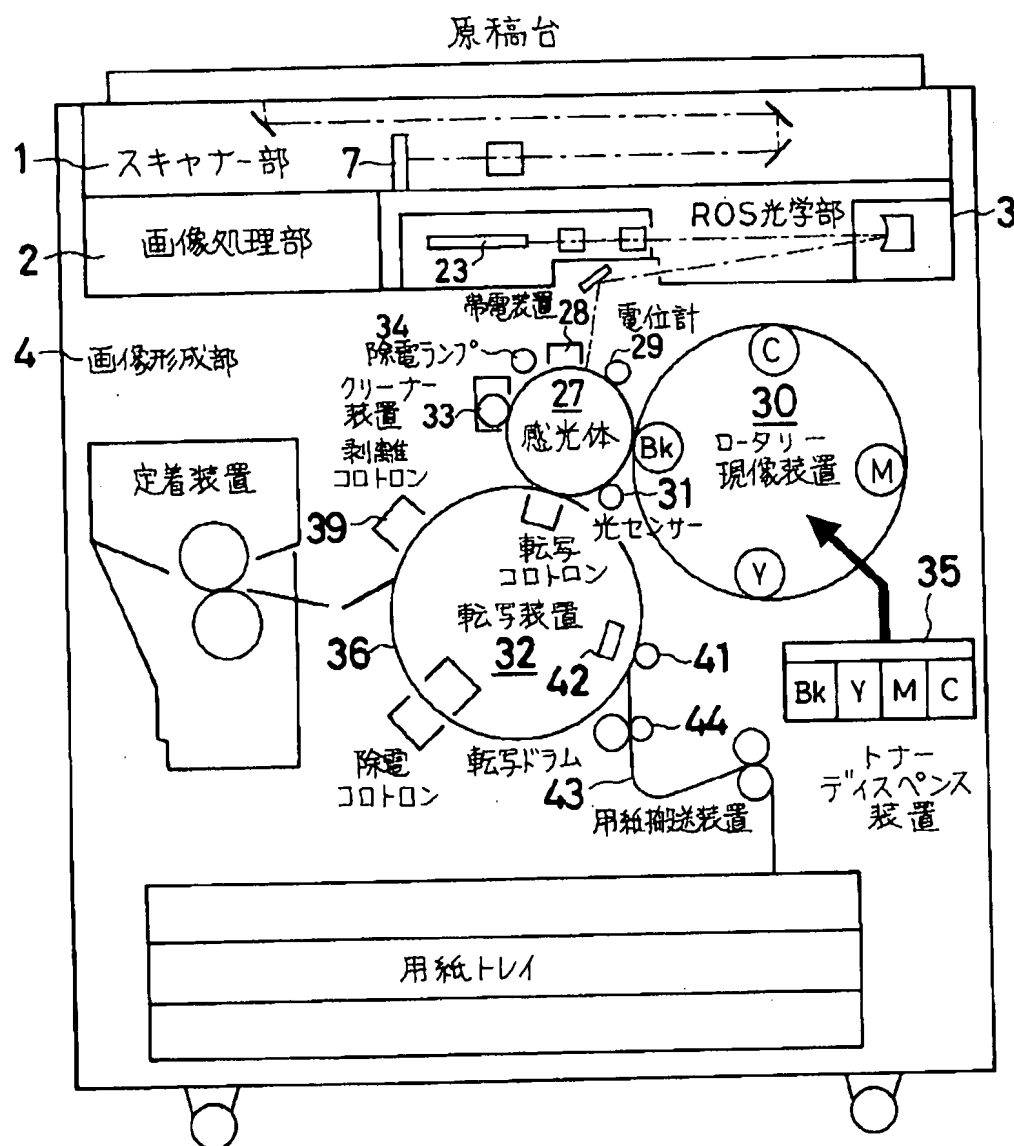
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]